

Claims:

1. A composite multilayer material, in particular for plain bearings or bushings, having a backing layer, a bearing metal layer (3) of a copper alloy or an aluminum alloy, a nickel intermediate layer (2) and an overlay (1), **wherein** the overlay (1) consists of approx. 0 - 20 wt.% copper and/or silver, the rest being bismuth, and the layer thickness of the nickel layer amounts to more than 4 μm .
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2. The composite multilayer material as claimed in claim 1, **wherein** the overlay (1) comprises at least approx. 0.5 wt.% copper and/or silver.
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3. The composite multilayer material as claimed in claim 1 or claim 2, **wherein** the overlay (1) consists of approx. 2 - 8 wt.% copper and/or silver, the rest being bismuth.
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4. The composite multilayer material as claimed in any one of claims 1 to 3, **wherein** the layer thickness of the overlay (1) amounts to approx. 5 - 25 μm .
- 25 5. The composite multilayer material as claimed in any one of claims 1 to 4, **wherein** the layer thickness of the overlay (1) amounts to approx. 6 - 14 μm .
- 30 6. The composite multilayer material as claimed in any one of claims 1 to 5, **wherein** the layer thickness of the nickel layer (2) amounts to approx. 4 - 6 μm .

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7. The composite multilayer material as claimed in any one of claims 1 to 6, **wherein** the bearing metal layer (3) consists of a copper-aluminum, copper-tin, copper-tin-lead, copper-zinc, copper-zinc-silicon, copper-zinc-aluminum, aluminum-zinc or copper-aluminum-iron alloy.
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8. The composite multilayer material as claimed in any one of claims 1 to 7, which has undergone an aging process and comprises an interdiffusion layer of substantially bismuth and nickel between the nickel intermediate layer and the overlay.
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9. A method for the production of the composite multilayer materials as claimed in any one of claims 1 to 8 by electrodeposition, in which the overlay is deposited from an aqueous-based electrolyte system of the following composition:
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- | | |
|--|---------------|
| bismuth methanesulfonate | 20 - 100 g/l |
| copper methanesulfonate | 0,1 - 30 g/l |
| | and/or |
| silver methanesulfonate | 0.1 - 2 g/l |
| methanesulfonic acid | 80 - 250 g/l |
| nonionic wetting agent | 20 - 100 g/l |
| grain refining agent | 5 - 40 g/l |
| resorcinol | 1 - 4 g/l |
| if silver methanesulfonate is added, then also | |
| thiourea | 30 - 150 g/l. |

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10. The method as claimed in claim 9, **wherein** the grain refining agent is based on an acrylic acid derivative and alkylaryl polyglycol ether.

5 11. The method as claimed in claim 9 or claim 10, **wherein** the nonionic wetting agent is based on aryl polyglycol ether and/or alkylaryl polyglycol ether.

10 12. Production of plain bearings or bushings having the following steps:

application of a copper alloy or an aluminum alloy onto a backing layer as bearing metal layer;

15 subdivision and shaping of the composite multilayer material;

application of a nickel intermediate layer onto the bearing metal layer;

20 electrodeposition of an overlay onto the nickel intermediate layer in accordance with the method as claimed in claims 9 to 11;

25 13. Production as claimed in claim 12, **wherein** the plain bearings or bushings are heat-treated for two or more hours to a few days.

30 14. Production as claimed in claim 13, wherein the temperature during heat treatment amounts to 150 - 170 °C.

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15. Use of the composite multilayer material as claimed in
claims 1 to 8 as a crankshaft main bearing.

16. Use of the composite multilayer material as claimed in
5 claims 1 to 8 as a connecting rod bearing, in
particular in the large connecting rod eye.